New computing capabilities reduce costs

Photo: SGI Altix 3700

INL's Richard Yamasaki in front of the SGI Altix 3700.

The need for high-performance computing has been growing at a very fast pace at Idaho National Laboratory (INL), the U.S. Department of Energy's lead lab for the development of the next generation of more efficient, safer nuclear power plants. INL doubled its aggregate computing capability over the last year via the purchase of a strong complement of high-performance computing and data storage and management technologies systems, and the acquisition of a high-performance SGI[R] Altix[R] 4700 system from SGI (Nasdaq: SGIC) was a key part of this advance. The SGI system, which will be used for a variety of nuclear energy and security applications, will enable INL to substantially increase productivity and save money.

"Our compute capacity expansion is driven by the needs of our high priority programs and by price/performance considerations," said Paul Meakin, a Laboratory Fellow and Director of the Center for Advanced Modeling and Simulation, Idaho National Laboratory. "In the long term, we're going to have to develop better nuclear fuel cycles and design new nuclear reactors, and other components; all require computation. Developing these systems, and conducting experiments, particularly with highly radioactive material, is extremely expensive. By doing simulations in conjunction with and before, physical experiments, the savings will far outweigh the cost of the hardware, the software and personnel. The addition of SGI technology is part of our commitment to satisfy the computational needs for these key programs."

INL's acquisition of a high-performance SGI[R] Altix[R] 4700 system was made in response to researchers' requests to run much larger simulations more efficiently and more cost effectively via shared-memory computing with a variety of compute-intensive chemistry, computational fluid dynamics and atmospheric codes in the Linux[R] operating environment. To complement its computing power, INL's purchased 9.6TB of SGI[R] InfiniteStorage 4000, a multi-purpose RAID system designed with versatility in mind. By deploying INL's critical information on an InfiniteStorage 4000, researchers can decrease management overhead while improving data accessibility speed and protection.

"The fact that the Altix is Linux-based is important to us because Linux has become an industry standard operating system in high-performance computing," said Eric Whiting, HPC System Architect, Idaho National Laboratory. "The commercial code we use is well-supported on Linux, and well-supported and optimized on the SGI Altix. One of the desirable characteristics of the 4700 is the large amount of shared memory. At this lab, we have several Linux clusters running very successfully; the clusters are fine for certain scientific codes. But there's a lot of code that runs much better on a system with a large amount of shared memory and a large number of processors. The 4700 is a good complement to our other resources."

"Idaho National Labs' installation is a prime example of how SGI solutions excel in the most demanding compute and data-intensive workflows," said Michael Brown, sciences segment manager, SGI. "The flexibility, scalability, and globally shared-memory architecture of the Altix system delivers the right combination of high performance compute, special purpose processing, memory and I/O elements, to meet the U.S. Department of Energy's distinct computing needs, and complements the scale-out capabilities of the SGI Altix XE cluster or those from other vendors."

INL also chose an SGI[R] Altix[R] 3700 system with SGI[R] RASC[TM] (Reconfigurable Application Specific Computing) technology. SGI's RASC technology uses Field Programmable Gate Arrays (FPGAs) to improve performance of routine algorithms and allow scientists to explore the latest innovation in programming technology. The SGI Altix 3700 system also employs graphics capabilities used for the design of control and security systems for nuclear power plants.

Idaho National Labs has three major research divisions all utilizing SGI technology: Science and Technology, National and Homeland Security, and Nuclear Programs. The divisions use the SGI Altix 4700 to run a wide variety of codes. Gaussian and quantum chemistry codes run fundamental research relevant to the new nuclear fuel cycles that are needed for the Global Nuclear Energy Partnership (GNEP). GNEP, part of President Bush's Advanced Energy Initiative, encourages expansion of domestic and international nuclear energy production while minimizing proliferation risks and reducing waste volumes and radioactivity of spent nuclear fuel before disposal in a geologic repository.

Photo: SGI Altix 4700

INL's Paul Meakin, David L Miller, Brent Stacey and Richard Yamasaki inspect the components of the SGI Altix 4700.

Computer-modeling simulations for security applications employ Allegra and ABAQUS[R] software, and the SGI Altix 4700 system is ideally suited to run these I/O intensive and memory-bandwidth intensive applications.

Optimized for computational fluid dynamics (CFD) applications and currently running STAR-CD and Fluent[R], the SGI Altix 3700 integrates both SGI[R] RASC technology and graphics for CFD work, which impacts nuclear research and development.

SGI servers and storage solutions deliver scalability and high performance in a cost-effective package. INL has used for more than six months an SGI Altix 4700 system with 96 Intel[R] Itanium[R] 2 processors running Novell[R] SUSE[R] Linux Enterprise 9; an SGI Altix 3700 with four ATI graphics cards powered by 24 Intel Itanium 2 processors; and a 9.6TB direct-attached SGI InfiniteStorage 4000 system.

About Altix

SGI Altix systems implement globally shared-memory architecture so that any CPU in the system can directly address any byte of memory or I/O device. Data is accessed at rates up to 200 times faster than possible using conventional clustering interconnects. Complex data sets and complete workflows can run directly in memory instead of requiring I/O, enabling productivity breakthroughs that traditional clusters or repurposed e-commerce servers can't tackle. This architecture provides unmatched scalability -- giving users the ability to expand memory, I/O and processors independently to address specific processing requirements without adding unnecessary cost.

SGI — Innovation for Results™

SGI (Nasdaq: SGIC) is a leader in high-performance computing. SGI delivers a complete range of high-performance server and storage solutions along with industry-leading professional services and support that enable its customers to overcome the challenges of complex data-intensive workflows and accelerate breakthrough discoveries, innovation and information transformation. SGI solutions help customers solve their computing challenges whether it's enhancing the quality of life through drug research, designing and manufacturing safer and more efficient cars and airplanes, studying global climate, providing technologies for homeland security and defense, or helping enterprises manage large data. With offices worldwide, the company is headquartered in Sunnyvale, Calif., and can be found on the Web at http://www.sgi.com.

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